



Designation: B 271 – 96 (Reapproved 2003)

## Standard Specification for Copper-Base Alloy Centrifugal Castings<sup>1</sup>

This standard is issued under the fixed designation B 271; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last approval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the Department of Defense.*

### 1. Scope\*

1.1 This specification establishes requirements for centrifugal castings of copper-base alloys having the nominal compositions shown in Table 1.

1.2 The values stated in inch-pound units are the standard. SI values in parentheses are given for information only.

### 2. Referenced Documents

2.1 The following documents in the current issue of the Book of Standards form a part of this specification to the extent referenced herein:

2.2 *ASTM Standards*:

B 208 Practice for Preparing Tension Test Specimens for Copper-Base Alloys for Sand, Permanent Mold, Centrifugal, and Continuous Castings<sup>2</sup>

B 824 Specification for General Requirements for Copper Alloy Castings<sup>2</sup>

B 846 Terminology for Copper and Copper Alloys<sup>2</sup>

### 3. Terminology

3.1 Definitions of terms relating to copper alloys can be found in Terminology B 846.

### 4. Ordering Information

4.1 Orders for centrifugal castings under this specification should include the following information:

4.1.1 Specification title, number, and year of issue,

4.1.2 Quantity (length or number) of castings,

4.1.3 Copper Alloy UNS Number (Table 1) and temper (as-cast, heat-treated, and so forth),

4.1.4 Dimensions or drawing number and condition (as-cast, machined, and so forth),

4.1.5 *ASME Boiler and Pressure Vessel Code* requirements (Section 9),

4.1.6 When castings are purchased for agencies of the U.S. Government, the Supplementary Requirements in Specification B 824 may be specified.

4.2 The following are optional and should be specified in the purchase order when required:

4.2.1 Chemical analysis of residual elements (Section 6.3),

4.2.2 Pressure test or soundness requirements (Specification B 824),

4.2.3 Approval of weld repair (Section 8),

4.2.4 Certification (Specification B 824),

4.2.5 Foundry test report (Specification B 824),

4.2.6 Witness inspection (Specification B 824),

4.2.7 Product marking (Specification B 824), and

4.2.8 Castings for seawater service (Section 5.2).

### 5. Materials and Manufacture

5.1 Castings in Copper Alloy UNS Nos. C95300, C95400, C95410, and C95500 may be supplied in the heat treated condition to obtain the higher mechanical properties shown in Table 2. Suggested heat treatments for these alloys and Copper Alloy UNS No. C95520 are given in Table 3. Actual practice may vary by manufacturer.

5.2 For better corrosion resistance in seawater applications, castings in Copper Alloy UNS No. C95800 shall be given a temper anneal heat treatment at  $1250 \pm 50^\circ\text{F}$  ( $675 \pm 10^\circ\text{C}$ ) for 6 h minimum. Cooling shall be by the fastest means possible that will not cause distortion or cracking which renders the castings unusable for the intended application.

5.3 Castings in Copper Alloy UNS No. C95900 are normally supplied annealed between  $1100^\circ\text{F}$  ( $595^\circ\text{C}$ ) and  $1300^\circ\text{F}$  ( $705^\circ\text{C}$ ) for 4 h followed by air cooling.

5.4 Castings in Copper Alloy UNS No. C95520 are used in the heat treated condition only.

### 6. Chemical Composition

6.1 The centrifugal castings shall conform to the chemical requirement shown in Table 4 for the Copper Alloy UNS Numbers specified in the purchase order.

6.2 These specification limits do not preclude the presence of other elements. Limits may be established and analysis required for unnamed elements agreed upon between the manufacturer or supplier and the purchaser. Copper or zinc may be given as remainder and may be taken as the difference between the sum of all elements analyzed and 100 %. When all named elements in Table 2 are analyzed, their sum shall be as specified in Table 5.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee B05 on Copper and Copper Alloys and is the direct responsibility of Subcommittee B05.05 on Castings and Ingots for Remelting.

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 02.01.

\*A Summary of Changes section appears at the end of this standard.



TABLE 1 Nominal Compositions

Classification	Copper Alloy UNS No.	Commercial Designation	Copper	Tin	Lead	Zinc	Nickel	Iron	Aluminum	Manganese	Silicon
Leaded red brass	C83600	85-5-5-5	85	5	5	5	...	...	...	...	...
	C83800	83-4-6-7 or commercial red brass	83	4	6	7	...	...	...	...	...
Leaded semi-red brass	C84400	81-3-7-9 or valve composition	81	3	7	9	...	...	...	...	...
	C84800	76-2½ -6½ -15 or semi-red brass	76	2½	6½	15	...	...	...	...	...
Leaded yellow brass	C85200	high copper yellow brass	72	1	3	24	...	...	...	...	...
	C85400	commercial No. 1 yellow brass	67	1	3	29	...	...	...	...	...
	C85700	leaded naval brass	61	1	1	37	...	...	...	...	...
High-strength yellow brass	C86200	high-strength manganese bronze	63	...	...	27	...	3	4	3	...
	C86300	high-strength manganese bronze	61	...	...	27	...	3	6	3	...
	C86400	leaded manganese bronze	58	1	1	38	...	1	½	½	...
	C86500	No. 1 manganese bronze	58	...	...	39	...	1	1	1	...
	C86700	leaded manganese bronze	58	1	1	34	...	2	2	2	...
Silicon bronze and silicon brass	C87300	silicon bronze	95	...	...	...	...	...	...	1	4
	C87400	silicon brass	82	...	½	14	...	...	...	...	3½
	C87500	silicon brass	82	...	...	14	...	...	...	...	4
	C87600	silicon bronze	89	...	...	6	...	...	...	...	5
Tin bronze and leaded tin bronze	C90300	88-8-0-4, or modified "G" bronze	88	8	...	4	...	...	...	...	...
	C90500	88-10-0-2, or "G" bronze	88	10	...	2	...	...	...	...	...
	C92200	88-6-2-4 or "M" bronze	88	6	2	4	...	...	...	...	...
	C92300	87-8-1-4, or Navy PC	87	8	1	4	...	...	...	...	...
High-lead tin bronze	C93200	83-7-7-3	83	7	7	3	...	...	...	...	...
	C93500	85-5-9-1	85	5	9	1	...	...	...	...	...
	C93600	81-7-12	81	7	12	...	...	...	...	...	...
	C93700	80-10-10	80	10	10	...	...	...	...	...	...
	C93800	78-7-15	78	7	15	...	...	...	...	...	...
	C94300	71-5-24	71	5	24	...	...	...	...	...	...
	C95200	Grade A	88	...	...	...	...	3	9	...	...
Aluminum bronze	C95300	Grade B	89	...	...	...	...	1	10	...	...
	C95400	Grade C	85	...	...	...	...	4	11	...	...
	C95410	...	84	...	...	...	2	4	10	...	...
	C95900	...	82.5	...	...	...	...	4.5	13	...	...
	C95500	Grade D	81	...	...	...	4	4	11	...	...
Nickel aluminum bronze	C95520	...	78.5	...	...	...	5.5	5.0	11	...	...
	C95800	...	81.3	...	...	...	4.5	4	9	1.2	...
	C97300	12 % leaded nickel silver	57	2	9	20	12	...	...	...	...
Leaded nickel bronze	C97600	20 % leaded nickel silver	64	4	4	8	20	...	...	...	...
	C97800	25 % leaded nickel silver	66	5	2	2	25	...	...	...	...

6.3 It is recognized that residual elements may be present in cast copper-base alloys. Analysis shall be made for residual elements only when specified in the purchase order.

## 7. Mechanical Properties

7.1 Mechanical properties shall be determined from test bar castings cast in accordance with Practice B 208 and shall meet the requirements shown in Table 2.

## 8. Weld Repair

8.1 The castings shall not be weld repaired without customer approval.

## 9. ASME Requirements

9.1 When specified in the purchase order to meet *ASME Boiler and Pressure Vessel Code* requirements castings in Copper Alloy UNS Nos. C95200 and C95400 shall comply with the following:

9.1.1 Certification requirements of Specification B 824.

9.1.2 Foundry test report requirements of Specification B 824.

9.1.3 Castings shall be marked with the manufacturer's name, the Copper Alloy UNS No., and the casting quality factor. In addition, heat numbers or serial numbers that are traceable to heat numbers shall be marked on all pressure-containing castings individually weighing 50 lb (22.7 kg) or

more. Pressure-containing castings weighing less than 50 lb (22.7 kg) shall be marked with either the heat number or a serial number that will identify the casting as to the month in which it was poured. Marking shall be in such a position as to not injure the usefulness of the casting.

## 10. General Requirements

10.1 The following sections of Specification B 824 form a part of this specification. In the event of a conflict between this specification and Specification B 824, the requirements of this specification shall take precedence.

10.1.1 Terminology (Section 3),

10.1.2 Other Requirements (Section 6),

10.1.3 Dimensions, Mass, and Permissible Variations (Section 7),

10.1.4 Workmanship, Finish, and Appearance (Section 8),

10.1.5 Sampling (Section 9),

10.1.6 Number of Tests and Retests (Section 10),

10.1.7 Specimen Preparation (Section 11),

10.1.8 Test Methods (Section 12),

10.1.9 Significance of Numerical Limits (Section 13),

10.1.10 Inspection (Section 14),

10.1.11 Rejection and Rehearing (Section 15),

10.1.12 Certification (Section 16),

10.1.13 Test Report (Section 17),

10.1.14 Packaging and Package Marking (Section 19), and